

C. 2. Tidal Salt Marsh

C. 2. a. Description. Tidal marshes have three major components: tidal creeks without vegetation, the regularly flooded *Spartina alterniflora* marsh ("low marsh"), and the irregularly flooded portion consisting of a mixture of species (high marsh). Tidal creeks are at the lowest elevation and are the conduit for water exchange between the greater estuary and the salt marsh surface. These creeks are extensions of mud flats, a community treated in more detail by Peterson and Peterson (1979). The *S. alterniflora* community represents the core of the salt marsh. It is often further divided into zones occupied by tall, intermediate, and short forms of *S. alterniflora*. The high marsh contains an increasing number of species of which *J. roemerianus*, *S. patens*, and *D. spicata* are common dominants or co-dominants. At the highest elevation, high marsh grades into upland vegetation.

Tidal flushing, hydroperiod, and salinity are the principal abiotic factors that determine zonation in the salt marsh environment. Tidal flushing provides the hydrologic energy for transport of dissolved and particulate material. Inorganic sediments are transported by tidal currents from deltaic riverine sources or from long-shore currents in the ocean. They are deposited on the marsh surface, but accumulate preferentially next to tidal creeks. This process results in creek-side levees of higher elevation and coarser particle size than the sediments toward the marsh interior. The presence of coarser sediments in the levee facilitates flushing of porewater in creek-side sediments.

The organic matter (OM) content of sediments in *S. alterniflora* is generally lower than that of the high marsh where suspended sediment supplies are limited because of infrequent flooding from estuarine waters and remoteness of the high marsh from the tidal creeks. Consequently, the *S. alterniflora* portion may contain only 10 to 20% OM (Pomeroy and Imberger 1981) while the *J. roemerianus* sediment may run as high as 70% OM (Brinson et al. In Prep.a).

Salinity of the rhizosphere is controlled by the balance of gains and losses of water and salt. Porewater salinity in the levee tends to be maintained close to that of adjacent estuarine waters because of frequent hydraulic exchange and better internal drainage than more isolated localities. Porewaters of the short *S. alterniflora* zone often reach hypersaline conditions during protracted periods of warm rain-less weather, high rates of evapotranspiration, and minimal hydraulic exchange because of neap tides (Nestler 1975). In the high marsh, precipitation contributes much to the site's water balance, and salinities may be low enough to support shrubs and other plants intolerant of high salinities (*Myrica*, *Cerifera*, *Baccharis halimifolia*, and *Iva frutescens*).

When these and other factors are taken together, the abiotic environment prevents growth of vascular plants in tidal creeks because of long hydroperiod and strong currents. Species richness (number of species) is restricted in the *S. alterniflora* zones because of high porewater salinity, frequent inundation, and anoxic, high sulfide porewaters associated with frequent inundation. There is greater species richness in the high marsh because of less stressful conditions overall: (1) periods of water table drawdown allow sediment aeration, (2) lower porewater salinities develop because of infrequent estuarine flooding, and (3) precipitation assumes greater importance as a source of water.

The zonation of vegetation in salt marshes is one of the best studied phenomena in ecology (Adams 1963; Kurz and Wagner 1957). From the elevation where colonization by emergent plants begins, *S. alterniflora* forms monospecific stands with occasional patches of barren sediment or *Salicornia* spp. It is not until the high marsh is reached that *J. roemerianus* and its associates, *S.*